# A PHOTOCENSUS OF THE KAMINURIAK HERD IN JULY 1987

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# A PHOTOCENSUS OF THE KAMINURIAK HERD IN JULY 1987

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## ABSTRACT

Post-calving aggregations of the Kaminuriak herd were located by radio-tracking 34 females and 4 males. The groups located were recorded by oblique photography on 35mm slides, if they were in tight enough formation to facilitate this method. This was done over two sampling periods -- July 13 - 14 and July 18 - 19, 1987.

The caribou images on the resulting photos were later counted and, using the ratio of radio collars in the groups photographed to the total radio collars in the population, an extrapolation was used to estimate the total size of the population. The two samples yielded two estimates: one of 230,000; the other, 260,000. Evidence of males missing from the samples suggests that these estimates may be low.

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# INTRODUCTION

Most estimates of the size of the Kaminuriak caribou herd have been based on extrapolations from calving ground surveys (Heard and Calef 1986). The presence of a large number of radio-collared cows in the Kaminuriak herd in 1987 was the first time post-calving photography could be evaluated as an alternative census technique (Valkenburg et al. 1985).

## OBJECTIVES

The objectives of this study were:

1) to explore the feasibility of photocensusing the post-calving aggregations of the Kaminuriak caribou herd;

2) to locate, using radio telemetry, and follow the post-calving aggregations of the Kaminuriak caribou herd until they were in proper formation for photography;

3) to photograph and count all of the caribou in the above aggregations in order to gain a minimum number for the herd size; and

4) to derive an extrapolated estimate of the number of animals in the Kaminuriak caribou herd.

# STUDY AREA

The area covered during the study lies along the west side of Hudson Bay from Eskimo Point (Arviat) to Rankin Inlet and inland to Banks Lake, Parker Lake, Thirty Mile Lake, Ferguson Lake, Turquetil Lake and Maguse Lake. This is the usual area occupied by the post-calving aggregations of the population.

## METHOD

Tracking of the radio-collared caribou in the Kaminuriak herd was performed in a Cessna 185 aircraft, using Telonics and Lotec scanning receivers and Telonics H antennae. Thirty-four radio-collared females and four males were located and relocated from 3 to 14 times. All of these animals were in post-calving aggregations. When these groups were in appropriate formations, they were recorded on colour slide film using 35 mm SLR cameras equipped with motor drives, and 50 mm lenses (one Nikon EM and one Canon T70). Shutter speeds were at least 1/250 of a second. The photographs were taken at an oblique angle to the ground and overlapped as the aircraft flew past the side of a group at an elevation of 200 - 300 m above the ground. If the near and far sides of the group were too far apart to fit in one frame, the camera was tipped up and down for two different overlapping photos before being panned ahead for the next two overlapping shots. If more than 36 frames were required to record one group, the second camera was employed. Roll numbers, frame numbers and groups were recorded in the field notes. The group numbers and locations were also recorded on 1:250,000 scale topographical maps.

Once the film was processed, the slides were projected onto white typing paper and overlap lines between adjacent slides were drawn. The caribou images were then marked with a pencil and each time this was done, a tally machine was depressed. Since calf images can be easily distinguished from all adult images, they were

counted on a separate tally. Therefore, once a slide was counted, two numbers were recorded on the marked paper. One number represented the number of caribou one year or older (referred to as adults throughout this paper) observed on a slide between the overlap lines, and the other represented the calf images counted. Once all appropriate slides had been counted, the resulting numbers were totalled. The total adult population of the Kaminuriak herd was derived by extrapolating this count to account for the number of radio collars not photographed but known to be operational.

# RESULTS

Field work was carried out from June 28 to July 19, 1987. Thirty-eight radio collars of a possible thirty-nine were heard from during the study, while one (150.211), that was heard from in June near Maguse Lake during calving group surveys (Doug Heard pers. comm.), was not heard from during this study. Since its frequency was monitored continually during the three week study, it must have malfunctioned or the caribou had moved out of the study area. There was no indication which of the above possibilities was true, but for the purpose of this census, it was assumed that the radio had malfunctioned.

A late snowmelt delayed the post-calving movements slightly. On June 28, there was still 40% snow cover and all the lakes were frozen. From June 28 to July 5, the caribou remained largely on the calving area used in 1987. The snow lingered until July 4. The first greening was apparent from the air on July 10 as some willows and birch leafed out. Some post-calving movement was apparent by July 2 and by July 5 the animals were moving rapidly and a loose aggregation of 20,000 to 30,000 began to form along the east side of O'Neil Lake. This aggregation grew to about 50,000 caribou and continued north along the east side of Kaminuriak Lake and Parker Lake during the next two weeks (Figure 1).

Another larger movement began July 2 and proceeded south from the Mandreville and Duffy lakes area and around Kaminak Lake to the east side of Maguse Lake. On July 10, they turned northeast and

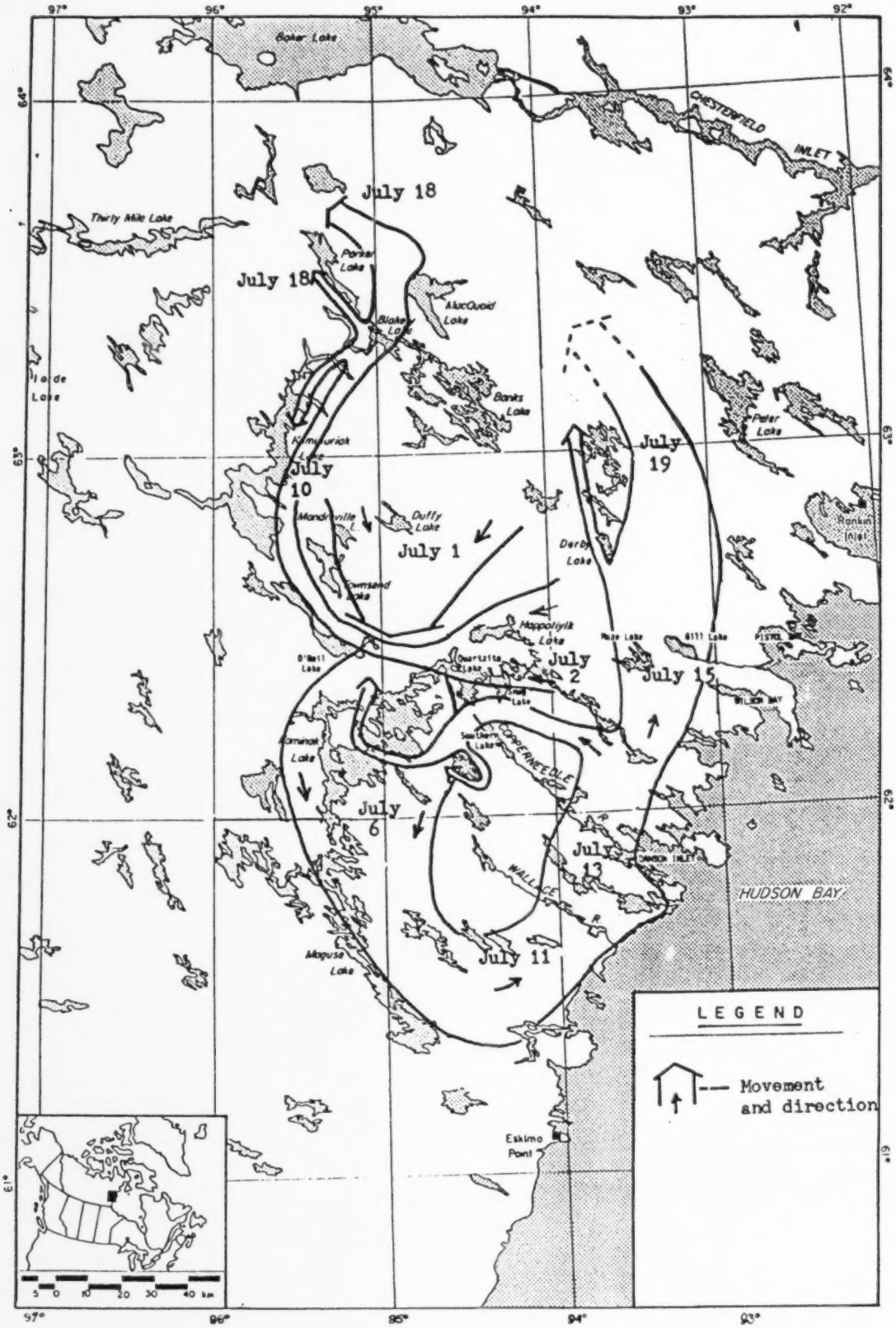


Figure 1. Movements of 30 radio-collared females, July 1 - July 19.

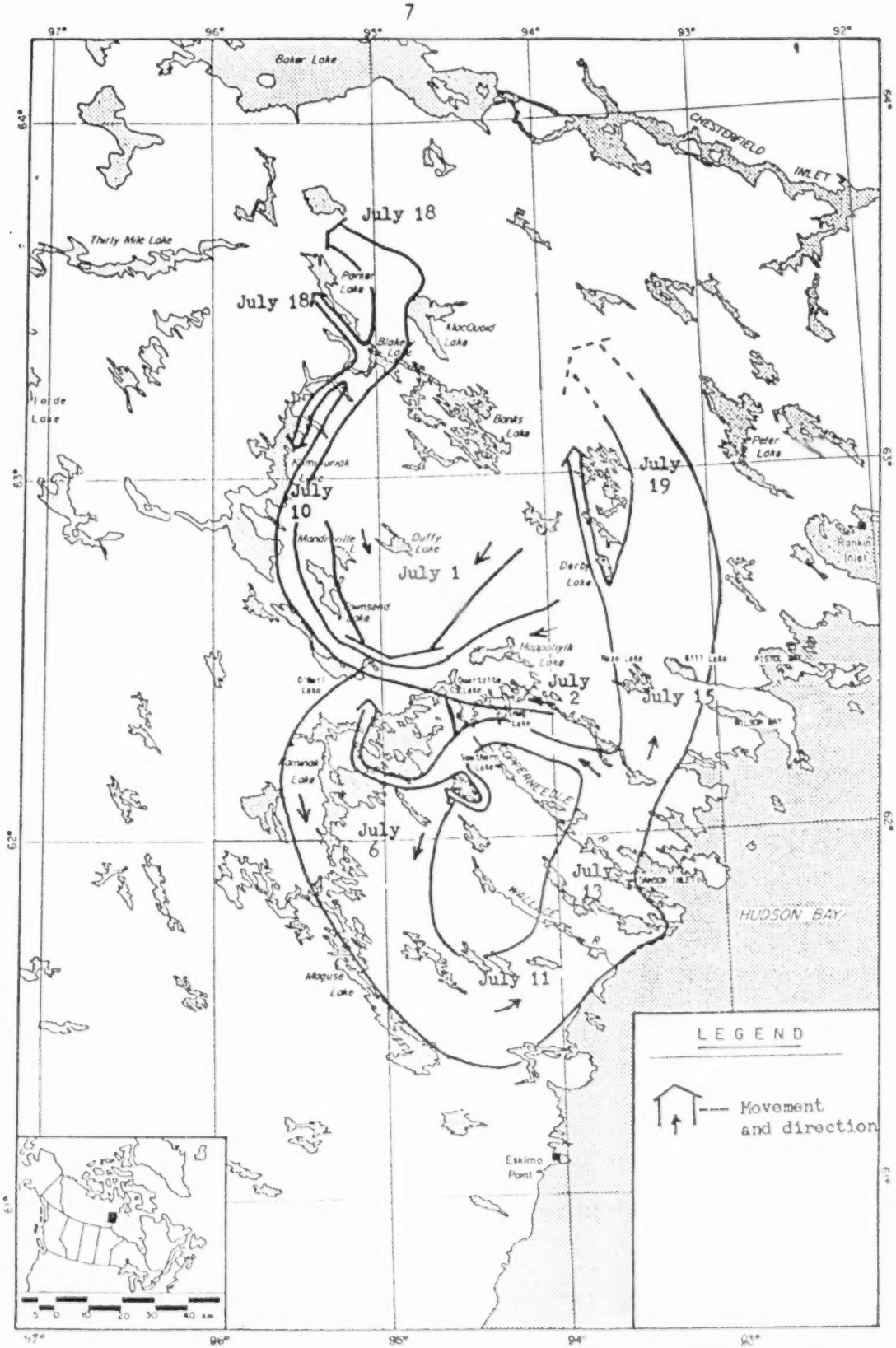


Figure 1. Movements of 30 radio-collared females, July 1 - July 19.

proceeded up the Hudson Bay coast to Dawson Inlet which they reached by July 13. From here, about 60,000 turned inland back to Kaminak Lake via Snug Lake and the north end of Southern Lake past Quartzite Lake. Another 100,000 proceeded northeast to Wilson Bay and then turned north and most passed between Derby Lake and Peter Lake.

A small group of 10 - 20,000 stayed near Kaminak Lake until July 13 and then proceeded northeast past Duffy Lake and, at the end of the study, they appeared to be about to join the 100,000 east of Banks Lake (Figure 2).

Another smaller group of 30,000 moved from O'Neil Lake and Happotiyik Lake on July 10 to Maze Lake and Pistol Bay on July 12. Some of this group joined the 100,000 as it moved north, while others lingered near the coast near Wilson Bay and Gill Lake.

While the above movements were taking place, the population was aggregated into a few large groups and twice, some of the groups tightened into formations conducive to excellent photography, thus allowing two samples to be acquired. The first sample was taken on July 13 and 14, the second on July 18 and 19. In both cases, the groups photographed on the first day of each sampling period were far enough away from groups photographed the second day that any interchange of caribou overnight was unlikely. This was confirmed by radio-monitoring for frequencies known to be in groups photographed the first day.

The first sample was taken on July 13 and 14 when the population was gathered into 17 large groups that contained all of

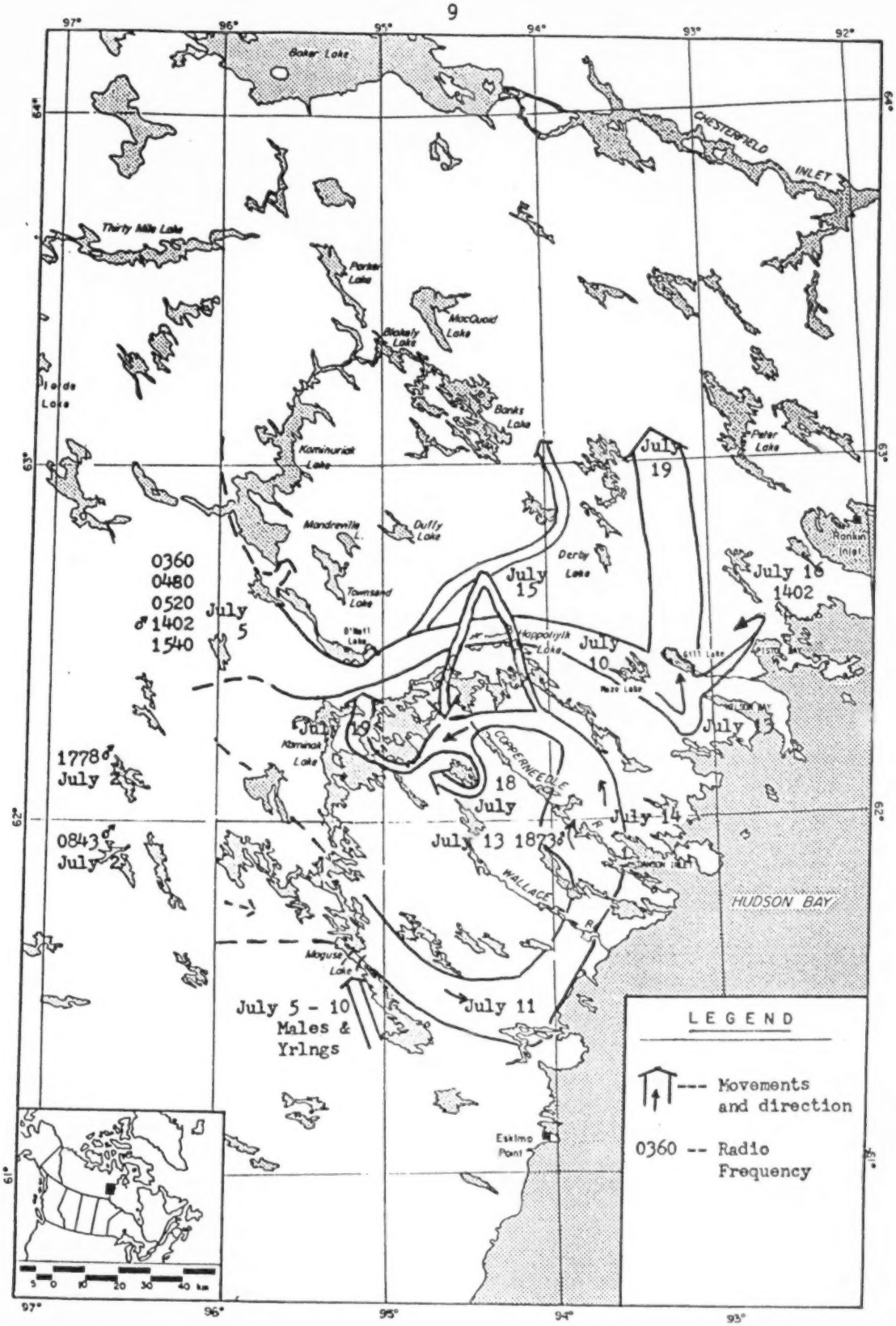


Figure 2. Movements of radio-collared male and 4 females, July 2 - July 19, 1987.

the 38 radio collars that were known to be in the population. Ten of these groups were in tight enough formation to be photographed and they contained 17 radios. Later analysis of the photos revealed 101,594 adults (Table 1, Figure 3). Using the 17:38 ratio of radio collars in the groups photographed to radio collars known to be in the population, the count can be extrapolated to an estimate of 227,000 adults in the population.

The July 18 and 19, or second, sample included 12 groups of the 18 observed and yielded a count of 128,661 adults (Table 1, Figure 4) with 19 radio collars, or exactly half the known radios, which extrapolates to a total population of approximately 257,000 adults.

The two samples together include 36 radio-collared caribou (28 different and 8 which are in both samples - Table 2). Ten radio-collared caribou were not in either of the samples.

Calves counted in Sample 1 totalled 27,000 or 21% of the total images. In sample 2, there were 37,000 counted or 22% (Table 1). The two samples combined included 64,000 calves which comprised 22% of the total count. The oblique photography caused some calf images to be eclipsed and, therefore, not all calf images were counted. The smaller image size also allowed some images to fade into the background terrain in some instances. It is calculated that about 75% of the calves in the group can be counted from the oblique photographs (Whitten et al. 1980). This suggests that the number of calves in the two samples was 85,000 which extrapolates to 90,000 calves in the population at the time of photographing.

Table 1. Radio-collared caribou and caribou counted in each group photographed in two samples, July 13 and 19, 1987, of the Kaminuriak herd.

| Date & Area | Group No. | Film Roll | Frame No. | Radio Frequencies | Adults | Calves | %Calves |
|---|---|---|---|---|---|---|---|
| July 13 | 1 | B-1 | 36 | 1010 | 554 | 140 | 20.2 |
| Kaminak | 2 | J-1 | 4-17 | 0240 | 8,383 | 1,523 | 15.4 |
| Lake; | 3 | J-1 | 18-38 | 0330 | 12,128 | 2,437 | 16.7 |
| July 14 | 4 | J-2 | 3-7 | 0170 | 8,764 | 3,053 | 25.8 |
| Dawson | 5 | J-2 | 8-25 | 0470 | | | |
| Inlet | | | | 1021 | 16,643 | 4,610 | 21.7 |
| | 6 | J-2 | 29-38 | 0340 | | | |
| | | | | 0820 | 9,758 | 4,488 | 31.5 |
| | 8 | J-3 | 8-32 | 0270 | | | |
| | | | | 0843[a] | | | |
| | | | | 1300 | | | |
| | | | | 1330 | | | |
| | | | | 1873[a] | 32,440 | 7,212 | 18.2 |
| | 9 | J-4 | 2-26 | 0461 | | | |
| | | | | 1440 | 9,302 | 2,972 | 24.2 |
| | 10 | J-3 | 33,35 | 0220 | 2,483 | 492 | 16.5 |
| | 12 | J-4 | 35,36 | 0510 | 1,139 | 255 | 18.3 |
| | | | | | --- | --- | --- |
| SUBTOTAL - SAMPLE 1 | | | | | 101,594 | 27,182 | 21.1 |
| July 18 | 18 | J-10 | 1-23 | 0500 | | | |
| Kaminur- | | | | 0630 | 14,168 | 4,799 | 25.3 |
| iak Lake | 19 | J-10 | 24-30 | | | | |
| | | J-11 | 4-14 | 0160 | 13,134 | 5,706 | 30.3 |
| | 20 | J-12 | 13-23 | 1420 | 1,786 | 501 | 21.9 |
| | 21 | J-12 | 30-36 | none | 1,426 | 683 | 32.4 |
| | 22 | J-14 | 22-36 | 0460 | | | |
| | | | | 1060 | | | |
| | | | | 1270 | 7,966 | 3,324 | 29.4 |
| | 23 | J-13 | 5-31 | 0330 | | | |
| | | | | 1010 | 10,615 | 2,589 | 19.6 |
| | 24 | J-14 | 1-16 | none | 3,321 | 676 | 16.9 |
| July 19 | 25 | J-17 | 10-12 | 1300 | 2,855 | 473 | 14.2 |
| Kaminak | 26 | J-17 | 2-8 | 1350 | 6,062 | 1,539 | 20.2 |
| Lake | 27 | J-16 | 18-33 | 0270 | | | |
| | | | | 0700 | | | |
| | | | | 1330 | | | |
| | | | | 1873[a] | 20,875 | 3,887 | 15.7 |
| | 28 | J-17 | 27-31 | | | | |
| | | J-18 | 1-29 | none | 17,253 | 5,054 | 22.7 |

Table 1 (continued)

| Date & Area | Group No. | Film Roll | Frame No. | Radio Frequencies | Adults | Calves | %Calves |
|---|---|---|---|---|---|---|---|
| | 29 | J-11<br>J-19 | 19-36<br>2-27 | 0843[a]<br>1021<br>1381<br>1778[a] | 29,200 | 7,779 | 21.0 |
| SUBTOTAL - SAMPLE 2 | | | | | 128,661 | 37,010 | 22.3 |
| TOTAL | | | | | 230,255 | 64,192 | 21.7 |

[a] frequencies of collars on male caribou.

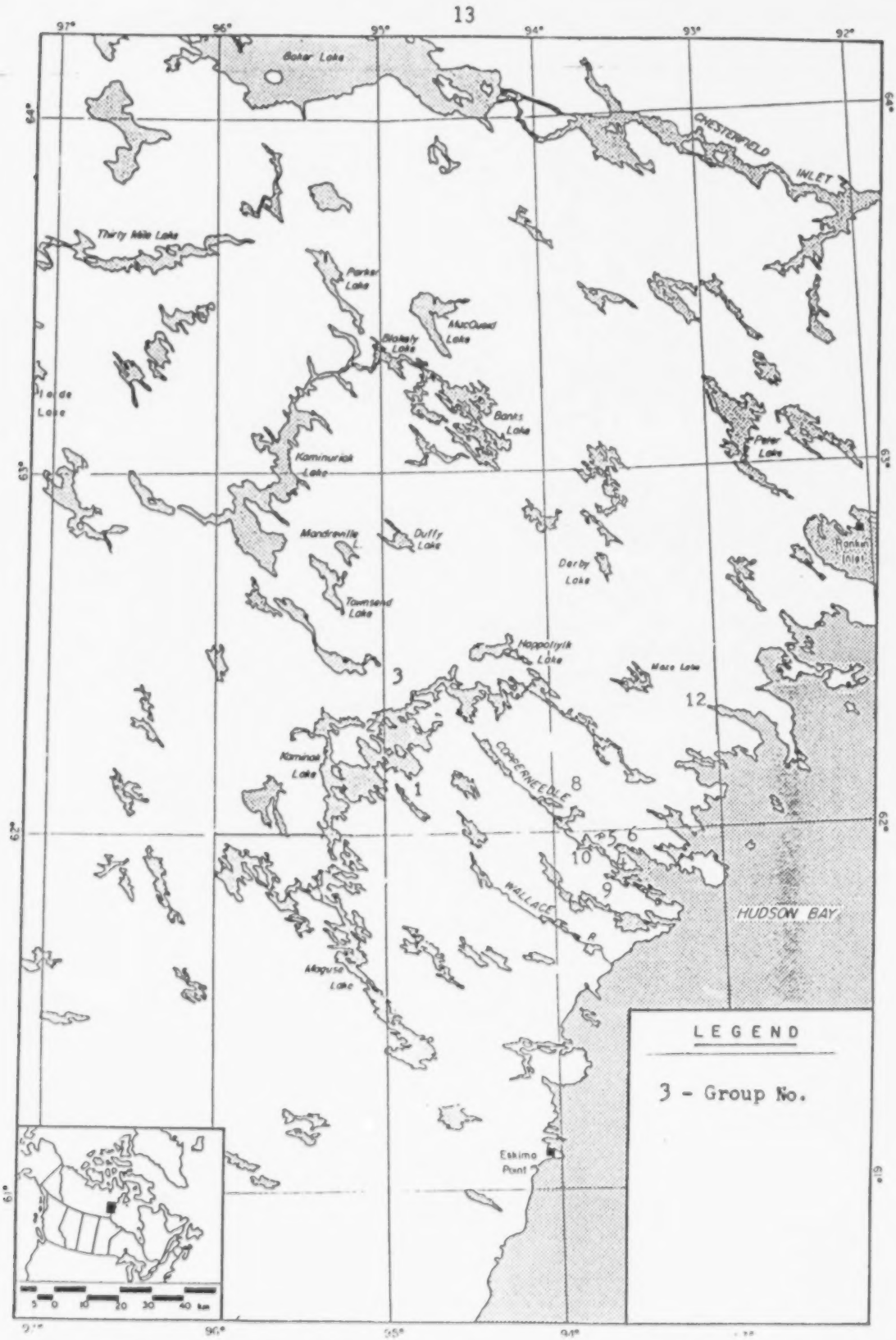


Figure 3. The location of groups photographed on July 13 and 14, 1987, Kaminuriak caribou herd.

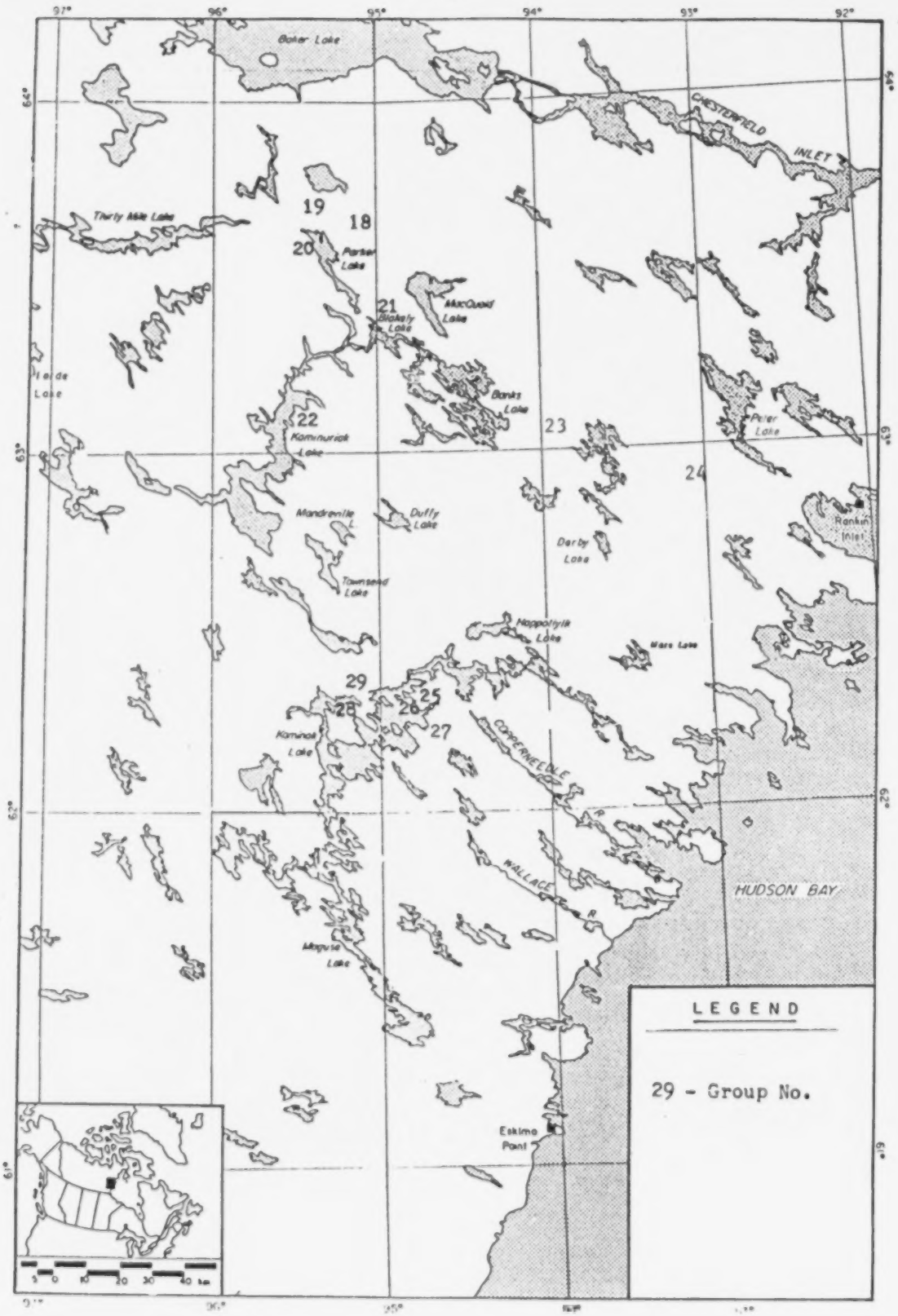


Figure 4. The location of groups photographed on July 18 - 19, 1987, Kaminuriak caribou herd.

Table 2. Caribou groups observed but not photographed on the second day of each sampling period and the radio collars contained therein during the photocensus of the Kaminuriak herd, 1987.

| Date | Check Point | Radio Freq. Present | | Area |
|---|---|---|---|---|
| July 14 | 21 | 0310 | | Nevill Bay |
| | | 0700[b] | | |
| | | 1381[b] | | |
| | | 1778[b] | | |
| | | 1350[b] | | |
| | 25 | 0360 | | Mistake Bay |
| | | 0480 | | |
| | 27 | 0181 | | Gill Lake |
| | | 1540 | | |
| | 28 | 0520 | | Gill Lake |
| | | 1290 | | |
| | | 1402 | | |
| | 29 | 0302 | | Blakely Lake |
| | | 0500[b] | | |
| | | 0630[b] | | |
| | | 1270[b] | | |
| | 30 | 0460[b] | | Kaminuriak Lake |
| | | 1060[b] | | |
| | | 1420[b] | | |
| | 31 | 0160[b] | | MacQuoid Lake |
| | | 1041 | | |
| July 19[c] | 1 | 0470[b] | | with 1000 near Derby Lake |
| | 2 | none | | approx. 6000 north of Derby Lake |
| | 3 | 0310 | | with 5000 north of Derby Lake |
| | 4 | 0170[b] | 0480 | with 50,000 west of Peter Lake |
| | | 0220[b] | 0510[b] | |
| | | 0340[b] | 0820[b] | |
| | | 0360 | 1290 | |
| | | 0461[b] | 1440[b] | |
| | 10 | none | | with 1000 south of Derby Lake |
| | 12 | 0520 | | with 5000 near Gill Lake |

[b] These frequencies were present in one of the samples in Table 1.

[c] Frequencies not heard from on this day were 0181, 0240[b], 0302, 1041, 1402 (male), 1540.

Group no. 6 was counted twice. The first count yielded 9,691 adults and 3,613 (27.2%) calves and was done near the start of the counting operation. The second count gave 9,758 adults and 4,488 (31.5%) calves and was done near the middle of the counting. That is, 67 more adults (less than 1%) and 875 (20%) more calves were detected in the second count. The small difference in the adult count suggests a high degree of accuracy. The large difference in the calf counts may reflect a slightly larger image size that was being used in the second count and/or increased attention on the part of the observer. The emphasis was being put on the adult count as this was the main one being used in the estimate of population size.

Roll J-11, frame 21 was also counted twice. The first count yielded 454 adults and 126 calves; the second, 499 adults and 113 calves, and was done near the end of the counting operation. I found 9% more adults and 10% fewer calves in the second count. An analysis of the two records of the counts indicated that at least 45 adults and calves were missed in the second count that were counted in the first, and 77 adult and calf images were missed in the first count. This suggests that there was more of a problem distinguishing caribou images from the terrain than there was distinguishing calves from adults.

# DISCUSSION

As discussed below, Objectives 2 and 4 of the study were met with reasonable satisfaction, while Objective 3 was partially met.

Objective 2: Thirty-eight radio-collared caribou were heard from on a regular basis and the post-calving movements were well understood during the course of the study as illustrated in Figures 1 and 2. These observed movements were different than any of those reported in the caribou monitoring and land use reports from 1978 to 1985 (Duquette 1985). However, it would appear from these reports that the post-calving movements varied considerably each year. One difference in 1987 that seems to have little or no counterpart in previous years is that calving (Doug Heard pers. comm.) and early post-calving occurred further south than usual; that is, around the periphery of Kaminak Lake. After a brief southward movement by about 75% of the population, all animals were moving in a northerly direction in mid-July, when in previous years the majority was reported to have been moving in a southerly direction. The main calving ground in 1987 being further south than any reported in the caribou monitoring reports from 1978 to 1985 may have been the cause of the more northerly direction of the mid-July movement.

Objective 3: A lack of synchrony as to when the post-calving groups moved into formations conducive to the photocensus did not allow the third objective to be fully met with photo techniques used in this and previous studies (Whitten et al. 1980, McLean and

Russell in prep.) This is discussed further in the Conclusions section of this report.

Approximately half of the population was photographed or sampled on two separate occasions. Three-quarters of the radio-collared caribou were in at least one of the samples (Tables 1 and 2). From Table 3, it can be seen that the distribution of the radio collars in the groups sampled was near random, with the exception of groups 22 and 28. Group 28, which contained no radios, was only 5 km from Group 29. However, it was large and visible from Group 29 and, therefore, unlikely to be missed.

Table 3 may indicate near randomness of only the female radio-collared caribou in the population. There is little indication that the radio-collared male caribou were accompanied by many other males. From Table 1, groups 8, 27, and 29 contained 2, 1 and 2 radio-collared males, respectively, yet the percentage of calves in the groups indicates that many of the adults had to be females. Whitten et al. (1980) and McLean and Russell (in prep.) reported large groups of predominantly males and yearlings with less than 5% calves while this study failed to record such groups.

The 22 percent of calves in this count is higher than the 20% reported in Whitten et al. (1980) or the 19% and 14% found by McLean and Russell (in prep.) in 1986 and 1987, respectively. This suggests that during the study there was exceptional calf survival or that males were missed in the study. The former is not likely, since the weather on the calving ground was unusually poor with storms and nearly 100% snow cover during calving (Doug Heard pers.

Table 3. Distribution of radio-collared caribou among the photographed groups in the post-calving aggregations of the Kaminuriak herd during the photocensus, July 13 to 19, 1987.

| Group No. | Group Size | No. of radio-collared caribou in group | Expected no. of radio-collared caribou in group |
|---|---|---|---|
| SAMPLE 1 | | | |
| 1 | 554 | 1 | 0.1 |
| 2 | 8,383 | 1 | 1.4 |
| 3 | 12,128 | 1 | 2.0 |
| 4 | 8,764 | 1 | 1.5 |
| 5 | 16,643 | 2 | 2.7 |
| 6 | 9,758 | 2 | 1.6 |
| 8a | 32,440 | 5 | 5.4 |
| 9 | 9,302 | 2 | 1.6 |
| 10 | 2,483 | 1 | 0.4 |
| 12 | 1,139 | 1 | 0.2 |
| | 101,594 | 17 | 16.9 |
| SAMPLE 2 | | | |
| 18 | 14,168 | 2 | 2.1 |
| 19 | 13,134 | 1 | 1.9 |
| 20 | 1,786 | 1 | 0.3 |
| 21 | 1,426 | 0 | 0.2 |
| 22 | 7,966 | 3 | 1.2 |
| 23 | 10,615 | 2 | 1.6 |
| 24 | 3,321 | 0 | 0.5 |
| 25 | 2,855 | 1 | 0.4 |
| 26 | 6,062 | 1 | 0.9 |
| 27[b] | 20,875 | 4 | 3.1 |
| 28 | 17,253 | 0 | 2.5 |
| 29[a] | 29,200 | 4 | 4.3 |
| | 128,661 | 19 | 19.0 |

[a] - groups containing 2 radio-collared males
[b] - groups containing 1 radio-collared male

comm.). Therefore, the latter may be the correct alternative.

The above three facts suggest that males were somehow missed in the samples. It seems that the four collared males failed to reveal all of the males. If this were the case, then the extrapolation estimate of 230,000 - 260,000 adults reflects an underestimate of the male segment of the population. Whitten et al. (1980) found predominantly male groups that comprised 15% of the adult count. This would suggest that the study may have missed male groups totally approximately 40,000 caribou, thus bringing the estimate up to 270,000 - 300,000 adults.

# CONCLUSIONS

In that Objective 3 was not fully met, the success of the census was limited by the fact that some groups were not in good formations for the photographic technique used. That technique requires that each group be photographed in one pass of the survey plane resulting in such little time elapsing between frames that the problem of caribou crossing overlap lines is insignificant. It is apparent that the technique needs to be adapted for use with phototransects (i.e., photographing the more scattered groups by more than one pass), for years such as this one. This would only be possible if the transects are very short and if the caribou are in groups that are feeding or moving very slowly in order that the extent of crossing of overlap lines be detected and compensated for.

In other years, the groups in the post-calving aggregations of the Kaminuriak caribou herd are likely to be formed into tight enough formations to be photographed in one pass as was the case in other populations censused with this technique to date. It is apparent from this study that the number of adults in the Kaminuriak caribou herd lies between 250,000 and 300,000 and that the technique can be used as is or with some alteration as discussed above to census this population. Heard and Calef (1986) report estimates of 126,000 - 320,000 made between 1983 and 1985. This study increases the minimum estimate to 250,000 adults.

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This report was reviewed by Doug Heard and Mark Williams.

# PERSONAL COMMUNICATIONS

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